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Silver nanoparticles effect on some immunological parameters in rabbits

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Abstract: *Silver nanoparticles that produced by clinical Morganella morganii ,were used in immunization rabbits and found effect on immunological parameter s,immunoglobulin IgG, concentrations were higher (3601.566±79.1) than control group (625.4333±39.95).IgM concentrations were decreased in test group (76.633±5.15) compared with control group(236.133±7.650) . Mitotic index for B cell also were determined and found there were increased in test group compare with control .Spleen was studied and found reactive follicular hyperplasia and congested red pulp and reactive follicular hyperplasia and congested blood vessel at 10xand white pulp no significant changes x 10 and congested red pulp x 40,the conclusion of this study that silver nanoparticles induce humoral immune response.*

I. Introduction

Silver nanoparticles (AgNPs) are produced by many mechanisms chemical synthesis ,physical synthesis ,photochemical and biological synthesis (Mitra *etal*. ,2013). AgNP used in consumer products because of their proposed antibacterial activity .Silver in the form of Ag^+ ion has toxic effects on many pathogens ,including bacteria ,viruses and fungi(Sarker *etal*.,2007)so many products used by human such as various medical applications (Rai *etal*.,2009)also found in number of commercial products including food packing and kitchen materials . Silver ions possess anti-microbial activity preventing microbial growth, silver based medicaments were historically used for wound and burns healing, being safe in limited doses for humans (Atiyeh *etal*.,2007).

Nowadays, when viral, bacterial and fungal resistance to drugs is a potential and increasing problem, scientists take an ancient knowledge into consideration, looking for a new form of solid silver mattery – silver nanoparticles (AgNPs). Nanoparticles by definition are particles smaller than 100 nm. Because of nano-size their physicochemical properties differ from the bulk substances .Several studies were attended with the effect of these materials on immune system ,Orlowski *eta*l,2012found silver nanoparticles were more toxic for monocyte and keratinocytes and induced caspase -1 activity and necrotic cell death and indicates their possible immunotoxic inflammatory potential ,so the aim of this study is the effect of silver nanoparticles on some immunological parameters

II. Materials and methods

Extracellular silver nanoparticles of *Morganella morganii* were achieved from previous work (Abd *etal* ,2013)

-Immunization

Forty mg/kilogram of silver nanoparticles was injected subcutaneously and intramuscular in rabbits(Rabbits of (1-1.5)Kg body weight were selected as test experimental animals .They were brought from local market and of local breed (*Orcyctalagus cuninculus*) among which 6 were checked and found to be free of pathogenic agents and grouped into two groups each of three and kept at libitum).

Histopathology-

spleen from control and test group were removed and fixed in a 10 % formalin solution containing normal saline .The organs were embedded in paraffin ,and stained with hematoxylin and eosin and examined under light microscopy .

Immunoglobulin concentration-

IgG and IgM concentration were determined by using radial immunodiffusion plate according the inter medical company

Mitotic index-

Femur was taken from each rabbits control group and test group ,mitotic index was studied according (Allen,1977)

III. Result and discussion

Concentration of IgG was increased in serum of rabbits that immunized with silver nanoparticles ,while the concentration of IgM was decreased compare with control groups ,these results appeared differences from other study ((De Jong *etal* ,2013)that increased in IgM this due to differ in source of silver nanoparticles .

Table (1)IgG and IgM concentration in rabid immunized by Silver nanoparticles

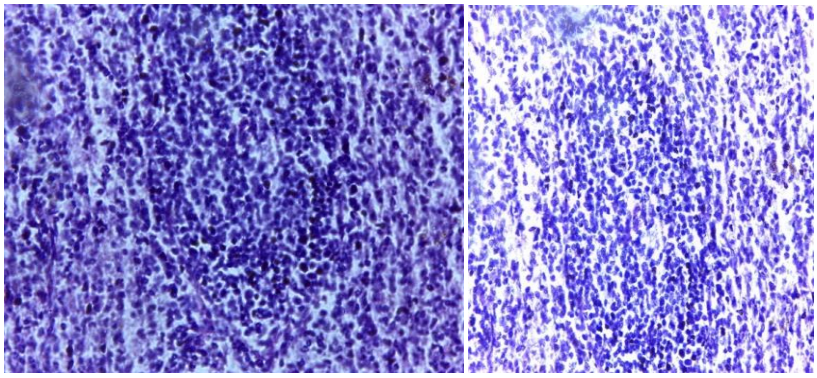
Group	IgG mg\dl Mean ± SD	IgM mg\dl Mean ± SD
Rabbits immunized with silver nanoparticles	3601.566±79.1	76.633±5.15
Rabbits immunized with normal saline (control)	625.4333±39.95	236.133±7.650

Silver nanoparticles effect on the lymphocytes production by increasing the mitoses of cells (table 2)this effect due to interaction between silver nanoparticles with immune component(Klippstein etal.,2010)

Table (2)Mitotic index in rabbit that immunized with silver nanoparticles

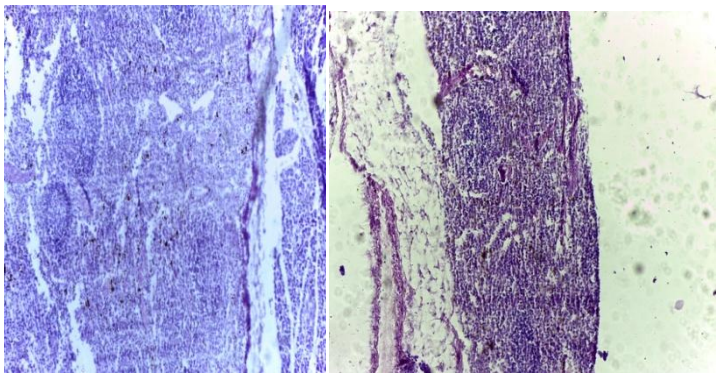
Group	Mean ± SD	p-value
Rabbits immunized with silver nanoparticles	**131.13±11.002**	**0.002**
Rabbits immunized with normal saline (control	**27.66±12.22**	

The effect of Ag-NP on rabbit spleen was appeared by increasing the follicular hyperplasia in test group (figure1,2,3)compare with control(figure4) this due to B cells increase in number. this agree with another study on Ag-NP in rats (De Jong *etal* ,2013)they found a severe increase in spleen size and weight was present which was due to an increased cell number. Both T and B cell populations showed an increase in absolute cell number, whereas the relative cell numbers remained constant.



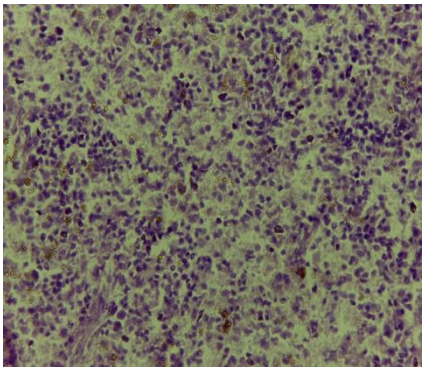
a b

Figure(1) spleen in rabbit immunized with silver nanoparticles : a-reactive follicular hyperplasia and b-congested red pulp x 40



a b

Figure(2) spleen in rabbit immunized with silver nanoparticles :a- reactive follicular hyperplasia and b-congested blood vessel x 10



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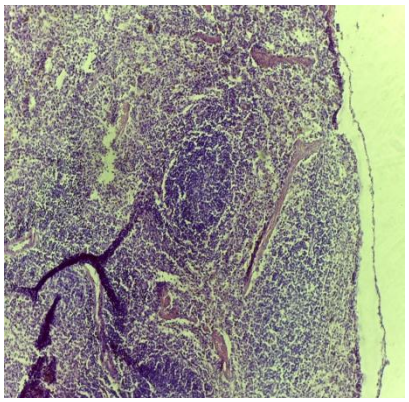
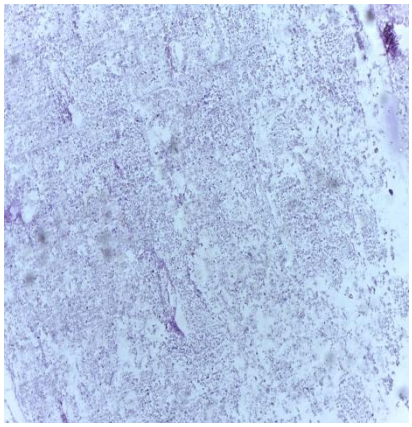


b

Figure(3)spleen in rabbit immunized with silver nanoparticles n:a- white pulp no significant changes x 10 and b- congested red pulp x 40



Figure(4)control spleen(rabbit)

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